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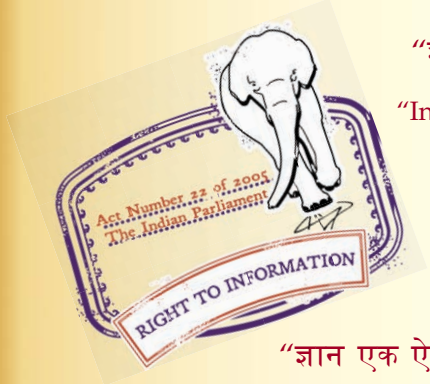

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IS : 10893 - 1984
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SPECIFICATION FOR SEALED NICKEL CADMIUM BUTTON TYPE RECHARGEABLE SINGLE CELLS

UDC 621·353·82

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3

October 1984

Indian Standard

SPECIFICATION FOR SEALED NICKEL CADMIUM BUTTON TYPE RECHARGEABLE SINGLE CELLS

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Indian Standard

SPECIFICATION FOR SEALED NICKEL CADMIUM BUTTON TYPE RECHARGEABLE SINGLE CELLS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 February 1984, after the draft finalized by the Secondary Cells and Batteries Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard deals with the sealed nickel cadmium button type rechargeable single cells.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers the general requirements and methods of tests for sealed nickel cadmium button type of rechargeable single cells.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following shall apply in addition to the definitions given in IS: 1885 (Part 8)-1965†.

2.1 Sealed cells are cells in which the products of electrolysis are consumed within the cell under normal charging and temperature conditions specified by the manufacturer, without any dangerous rise in pressure. These cells do not require addition of electrolyte during their life. They are designed to operate during their life in the original sealed condition.

2.2 A button cell is a cell of circular section with a diameter generally larger than the height.

*Rules for rounding off numerical values (*revised*).

†Electrotechnical vocabulary: Part 8 Secondary cells and batteries.

3. CELL DESIGNATION

3.1 The cells shall be designated by a letter (*L*) or (*H*) which signifies whether the cell is designed for low (*L*) or high (*H*) rates of discharge.

4. MATERIALS AND CONSTRUCTION

4.1 Cell Cups and Cell Covers — The cell cups and cell covers shall be of high strength alkali resistant material suitably chosen, such as nickel plated mild steel.

4.2 Electrolyte — The electrolyte used shall be a solution of potassium hydroxide in deionised or distilled water made up to a specific concentration or specific gravity at 27°C.

4.3 Separators — The separators used for the cells shall be porous alkali resistant and shall have insulating capacity to avoid shorting between the plates of opposite polarity.

5. PERFORMANCE REQUIREMENTS

5.1 Nominal Voltage — The nominal voltage of sealed nickel cadmium button type rechargeable single cells shall be 1·20 V per cell.

5.2 Rated Capacity — The rated capacity in ampere-hours shall be:

a) The capacity, in 10-hour discharge for cells designated by the letter '*L*'; and

b) The capacity, in 5-hour discharge for cells designated by the letter '*H*'.

5.2.1 The cells for the rated capacity test shall be tested in accordance with **9.6.**

6. MARKING AND PACKING

6.1 Marking — The cells shall be marked with the following:

a) Manufacturer's name and trade-mark,

b) Year of manufacture,

c) Nominal voltage,

d) Rated capacity,

e) Cell designation, and

f) *Polarity Marking*—The polarity shall be marked for identification. The positive shall be marked 'P' or '+' and the negative shall be marked 'N' or '—'. Marking shall be permanent and non-deteriorating.

6.1.1 The cells may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6.2 Packing — The cells shall be suitably packed so as to avoid any loss or damage during transit.

7. MANUAL OF INSTRUCTIONS

7.1 A copy of instruction manual for charging and maintenance during service shall be supplied by the manufacturer.

8. CONDITIONS OF SUPPLY

8.1 To facilitate procurement of cells giving satisfactory performance, it is recommended that the cells give a satisfactory performance over a temperature range of $-18°C$ to $+45°C$.

9. TESTS

9.1 Classification of Tests

9.1.1 *Type Tests* — The following tests shall constitute type tests and shall be carried out in the sequence given below:

a) Physical examination (**9.2**),

b) Verification of dimensions and weight (**9.3**),

c) Verification of marking and packing (**9.4**),

d) Polarity and short circuit test (**9.5**),

e) Leakage test (**9.6**),

f) Test for capacity (**9.7**),

g) Test for overcharge (**9.8**),

h) Test for retention of charge (**9.9**),

j) Discharge performance at low temperature (**9.10**),

k) Discharge performance at high temperature (**9.11**),

m) Life cycle (**9.12**), and

n) Storage test (**9.13**).

9.1.1.1 Twelve samples for the type tests shall be drawn at random by the inspecting or testing authority. The tests (a) to (e) shall be conducted on all the 12 samples drawn while tests (f) to (m) shall be conducted on 2 samples each.

9.1.1.2 If any sample fails in the relevant type tests, the testing authority may call for fresh samples not exceeding twice the original number and subject them again to the tests in which failure occurred. If there is any failure in retest(s), the type shall be considered as not having passed the requirements.

9.1.2 *Acceptance Test* — The following tests shall constitute the acceptance tests:

a) Verification of dimensions and weight (**9.3**),

b) Verification of marking and packing (**9.4**),

c) Test for polarity and short circuit (**9.5**),

d) Leakage test (**9.6**),

e) Test for capacity (**9.7**),

f) Test for overcharge (**9.8**), and

g) Test for retention of charge (**9.9**).

9.1.2.1 The acceptance tests from (a) to (d) shall be carried out on all cells. For tests (e) to (g) the sampling scheme and criteria for acceptance shall be in accordance with **5.1.4** of IS : 8320-1976*.

9.2 Physical Examination — The cells shall be examined for conformity with the requirements of **4**.

9.3 Dimensions and Weight — The cells shall be checked for conformity with the relevant requirements given in Table 1.

9.4 Marking and Packing — The cells shall be examined for conformity with the requirements of **6**.

9.5 Test for Polarity and Short Circuit — The correctness of the polarity shall be verified electrically. The absence of short circuiting shall be checked by measuring the voltage of each cell.

9.6 Leakage Test — Under consideration.

*General requirements and method of test for lead-acid storage batteries.

TABLE 1 DIMENSIONS AND WEIGHT

(*Clause* 9.3)

DIAMETER IN mm	HEIGHT IN mm	WEIGHT
(1)	(2)	(3)
7·8	5·5	To be specified
11·6	5·5	
15·6	6·1	
20·0	6·6	
22·9	5·5	
25·2	6·4	
25·2	7·7	
25·2	9·5	
25·2	15·0	
34·6	5·5	
34·6	9·8	
34·6	10·5	
43·2	8·1	
50·7	7·7	
50·7	8·6	
50·5	10·5	
50·9	15·4	
50·3	25·3	
Tolerances { 0·3 mm for diameter { 0·4 mm for diameter	25 mm $\leq$ —0·6 mm for height $\leq$ 8 mm 25 mm $>$ —1·0 mm for height $>$ 8 mm	

9.7 Test for Capacity — The charging of cells shall be carried out at a constant current of 0·1 C_5A or 0·1 C_{10}A as per cell designation for a duration of 14-16 hours. The cells shall then be stored for not less than 8 hours and not more than 24 hours at 27 ± 2°C. The capacity in ampere hours shall then be assessed by discharging the cell at this temperature at a constant current of 0·1 C_{10}A for cells designated as '*L*' and 0·2C_5 A for cells designated as '*H*'. The discharge shall be discontinued when the cell voltage has reached 1·0 V. The capacity obtained shall be not less than 0·95C_{10} or 0·95C_5 for cells designated *L* and *H* respectively and shall be obtained within any of the first five cycles.

9.8 Overcharge Test — The cell after being charged in accordance with **9.7** shall be subjected to a constant overcharge current of 0·02C_{10}A or 0·02C_5A for cells designated '*L*' and '*H*' respectively for 28 days.

Throughout this period the cells shall be maintained at $40 \pm 3°C$ by suitable means. The cells shall then be conditioned at $27 \pm 2°C$ for not less than 8 hours and then discharged at 0·1 $C_{10}A$ or 0·2 C_5A for cells designated '*L*' and '*H*' respectively up to the end voltage of 1·0 volt. The cells shall have a capacity not less than 85 percent of the rated capacity. There should be no leakage during or at the end of the test.

9.9 Retention of Charge — The cell shall be fully charged in accordance with **9.7** and shall then be subjected to two consecutive capacity tests in accordance with **9.7**. The value of the initial capacity Ci being calculated as the mean of the two results thus obtained. After a complete recharge, the cell shall then be left on open circuit for a period of 28 days without disturbance at $27 \pm 5°C$.

After 28 days of storage, the cell shall be discharged in accordance with **9.7**. The value of capacity obtained after storage is denoted as Cs. The loss of capacity 'S' expressed as percentage is calculated from the following formula:

$$S = \frac{Ci - Cs}{Ci} \times 100$$

9.9.1 *Requirement* — The loss in the capacity 'S' shall not exceed 35 percent.

9.10 Discharge Performance at Low Temperature — The cell shall be charged at room temperature in accordance with **9.7** and conditioned at $-20°C \pm 2°C$ for a period of not less than 16 hours. The cell shall then be discharged at this temperature at a constant current of 0·2 C_5A/0·1 $C_{10}A$ as per cell designation to an end voltage of 0·9 V. The Ah capacity obtained shall not be less than 60 percent of the rated capacity.

9.11 Discharge Performance at High Temperature — The cell shall be charged at room temperature as per **9.7** and conditioned at $+45°C \pm 2°C$ for a period of not less than 16 hours. The cell shall then be discharged at this temperature at a constant current of 0·2 C_5A/0·1 $C_{10}A$ as per cell designation to an end voltage of 1·0 V. The Ah capacity obtained shall not be less than 70 percent of the rated capacity.

9.12 Life Cycle — Before the life test the cell shall be charged and discharged in accordance with **9.7**. The life test shall be carried out at a temperature of $27 \pm 2°C$. Throughout this test, the cell shall be maintained at this temperature by suitable means.

9.12.1 The cell shall be charged and discharged at a rate and time as given in Table 2.

TABLE 2 CHARGE AND DISCHARGE PERIOD

(*Clause* 9.12.1)

CYCLES	CELL DESIGNATED 'H'		CELL DESIGNATED 'L'	
	Charge	Discharge	Charge	Discharge
(1)	(2)	(3)	(4)	(5)
1	0·2 C_5A for 7 hours	0·225 C_5A for 2 hours 30 minutes	0·1 $C_{10}A$ for 14 hours	0·125 $C_{10}A$ for 5 hours
2-27	0·225 C_5A for 3 hours 30 minutes	0·225 C_5A for 2 hours 30 minutes	0·125 $C_{10}A$ for 7 hours	0·125 $C_{10}A$ for 5 hours
28	0·2 C_5A for 7 hours	0·2 C_5A up to an end voltage of 1·0 V	0·1 $C_{10}A$ for 14 hours	0·1 $C_{10}A$ up to an end voltage of 1·0 V

9.12.2 The test cycles as given in Table 2 shall be repeated until the ampere hour capacity becomes less then 60 percent of rated capacity when tested at the 28th cycle which is the checking cycle. The number of cycles obtained with a capacity above 60 percent shall not be less than 392 cycles.

9.13 Storage Test — The cells shall be stored at an ambient temperature of $27 \pm 10°C$ and a relative humidity not exceeding 90 percent for a period of 3 years. After storage for the above period the cells shall be discharged at a current of $0{\cdot}2C_5A/0{\cdot}1C_{10}A$ as per cell designation to an end voltage of 1·0 V after carrying out the instructions of the manufacturer for commissioning back the cells. The Ah capacity of the cell shall then be measured in accordance with **9.7**. The capacity obtained within the first five cycles shall be not less than 95 percent of rated capacity.

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1145-1980 Lead-acid storage batteries for motor cycles, auto-rickshaws and similar vehicles (*second revision*)

1146-1981 Rubber and plastics containers for lead-acid storage batteries (*second revision*)

1651-1979 Stationary cells and batteries, lead-acid type (with tubular positive plates) (*second revision*)

1652-1972 Stationary cells and batteries, lead-acid type with plante positive plates (*first revision*)

1846-1961 Lead-acid storage batteries for aircraft (aerobatic and non-aerobatic)

1885 (Part VIII)-1965 Electrotechnical vocabulary: Part VIII Secondary cells and batteries

2512-1978 Miner's cap lamp batteries (lead-acid type) (*first revision*)

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6071-1970 Synthetic separators for lead-acid batteries

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7624-1975 Lead-acid starter batteries for diesel locomotives and rail cars

7660-1975 Lead-acid batteries for electric locomotives and electrical multiple units

8320-1982 General requirements and methods of tests for lead-acid storage batteries (*first revision*)

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